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TRANSACTIONS

OF THE

SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

DECEMBER, 1909.

VOLUME III. No. 2.

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SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

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VOLUME III. No. 2.

At a Meeting of the Society of Tropical Medicine and Hygiene, on November 19th, 1909.

DR. H. WOLFERSTAN THOMAS

Of the Liverpool School of Tropical Medicine contributed the following communications as a result of his research work in South America, on

(a) Œsophagostomiasis in Man, with specimens and illustrations shown by the epidiascope.

(b) The results of inoculation experiments with virulent blood of Yellow-Fever cases or by the bites of infected Stegomyia Calopus.

(c) Mossy Foot of the Amazon region, with microscopic specimens, and illustrations shewn by the epidiascope.

(d) Notes on Stimson's Spirochæte, found in the kidney of a Yellow-Fever case.

ŒSOPHAGOSTOMIASIS IN MAN.

The history of this case of Œsophagostomiasis is unknown. The patient, a man, *æt* about 36, a native of the Amazon State, came from the River Purus region. He was admitted to the public ward of the Santa Casa in Manaos as suffering from dysentery. He became delirious and died within three days of entrance. The autopsy was performed ten hours after death.

On opening the abdomen a chronic peritonitis was seen, involving the right side and matting the omentum and coils of the small intestine to the cæcum and ascending colon. The small intestine was distended with gas. The spleen was not enlarged, but there was a marked perisplenitis. The capsule of the organ was thickened in places and there was a cartilaginous area on the superior surface, the size of a florin. The diaphragm was free; the liver, kidneys, etc., were partly decomposed, but showed cloudy swelling.

As the adhesions were very firm, the small intestine, cæcum, ascending and transverse colon, were taken out *en masse*, and placed in Kaiserling's fluid for later examination.

On examination of the bowel, nodular cystic masses were found involving the outside of the walls of the ileum, cæcum and colon. In separating the adhesions, one of these cysts were ruptured, and a small worm was easily pressed out.

Small Intestine.

About one metre's length of the small bowel from the ileo-cæcal valve is studded with small raised dough-like tumours. The greater number involve the lower part of the ileum for a distance of 35 cm. from the ileo-cæcal

valve. The nodules are less frequent and pronounced in the remaining 65 cm. of the infected bowel. These tumours appear to lie on the surface of the external muscular layer of the bowel and just beneath the peritoneum. Thirty-seven easily seen nodules can be counted. The smaller ones are oval and measure up to 9 mm. by 7 mm., and are raised 8 mm. above the surface—others are flatter and more button-shaped—others again are elongated leach-like masses, 14-23 mm. in length and 6 mm. thick. They project 4-9 mm. above the surface. They are opaque and greyish-black in colour, with sometimes a few light ochre-coloured points in the tumour wall. Some are along the mesenteric attachment; others are on the side or upper surface of the intestinal tube. On incising a nodule, a small worm is seen lying in a semi-liquid brownish mass.

Interior.—On opening the bowel about twenty nodules are seen situated in the walls, causing a bulging of the mucous membrane into the lumen of the gut. They are the size of small beans, and on opening one a small worm is found occupying the cyst.

At two places in this piece of bowel the walls are extremely thin and sacculated. At either end of the pouches quite large nodules occur, which, developing in the sub-mucous coat and lying parallel to the mesenteric attachment, have fastened on to both the side walls, and have thus materially narrowed the lumen of the gut, forming a more or less actual stricture, so that it is difficult to introduce the tip of the little finger. Dilatation has occurred, in parts the walls resemble very much a sprue gut. Peyer's patches are slightly enlarged and the mucous membrane of the small intestine shows evidences of inflammation.

Cæcum.

External Surface.—The walls of the cæcum are mottled all over with bluish-black irregularly shaped areas, especially along the anterior and posterior longitudinal bands. These areas are covered by the peritoneum, and on incising are found to contain encysted worms.

The appendix at its junction with the cæcum is surrounded on two sides by a bluish tumour mass, which so distorts its lumen as to make it almost impossible to introduce a probe through the canal into the cæcum.

Near the tip of the appendix, a bean-shaped nodule, 8 by 10 mm., is growing from the external muscular and subperitoneal layers of the wall. It does not involve the lumen. On microscopic examination two other small tumours are found near the large one, and situated in the submucosa.

Interior.—A noticable feature is the extreme rigidity of the walls of the cæcum and first part of the ascending colon. On opening the bowel one finds a series of cord-like prominent opaque masses infiltrating the walls of the cæcum. They measure 1-5 cm. in length, with broad bases 9-22 mm., from which they radiate. The extent of these masses is best seen by holding the gut up to the light. The masses are situated between the internal muscular and submucous layers, and are composed of several nodules closely adjoining one another. On each of the cysts is an immature adult œsophagostome.

The ileo-cæcal valve is thickened and very rigid. Five small submucous cysts infiltrate the wall.

The Ascending Colon.

The walls of the ascending colon are seen to afford lodgment for a great number of tumours. These tumours

lie transversly and appear to be more numerous along the posterior wall. They are mostly between the internal muscular submucous coats, and form very prominent bulgings into the cavity. Many small spherical or oval tumours are arranged in rows 2-3 cm. in length. Others infest the plica sigmoidea. They do not appear to communicate with another.

Several tumours are present measuring 18 by 10 mm., and projecting well into the lumen of the gut, causing manifest obstruction. The walls of the colon in places are extremely thin and occur where large numbers of these tumours infiltrate the muscular coat.

Exteriorly.—Along the anterior and posterior longitudinal bands, are dark bluish masses lying between the muscular and peritoneal coats. The walls of the gut are greatly thickened, and the cut surface of the wall shows a hard fibrous-like mass 9-12 mm. thick, which is honeycombed by small oval cavities 3 by 5 mm., in which parts of worms are seen. In many places along the posterior wall it is impossible to make an incision without opening some of these cysts. Many of these cysts appear to have spread towards the mucosa and also external muscular layers, and have formed prominent nodules on both internal and external surfaces of the colon.

On opening a submucous cyst a worm is found lying in a semi-fluid greyish-brown to black-brown mass. The worm may be coiled or twisted on itself or may lie flat and straightened out. The head is usually imbedded in the muscular layer. Sometimes a membranous cast is seen around an immature adult worm, as if it had moulted. Some cysts are seen with ochre-coloured spots on the cyst wall, these are necrotic areas and show "gram" negative bacilli as well as "gram" positive micrococci with

numerous pus cells and degenerated necrosed epithelium.

The hæmorrhagic cysts occurring in the subperitoneal layer, are composed mostly of degenerated blood cells and pigment granules, which give iron reaction. The worms here appear to be not so mature as those present in the submucous cysts. Very often a subperitoneal cyst appears to have had a communicating passage with a submucous cyst. Evidences of cicatrization of some of the cysts is observed, and the cyst walls are closely approximated. They contain no worms.

A small gland in the adhesions between a coil of small intestine and omentum was observed to be cystic, and to contain a medium-sized immature worm. Two other glands were found containing large empty cysts. All the mesenteric and retroperitoneal glands are greatly enlarged.

The number of tumours visible, microscopically, are over 187. These involve the cæcum and nine inches of the ascending colon.

Fifty-three cystic nodules were opened up; sixteen were found to contain immature males, and thirty-seven females. This does not appear to coincide with Weinberg's results as in the monkeys and apes, the male Œsophagostome was found in greater numbers. Only one worm was found in each cyst. Several cysts in the cæcum and colon were found to be empty. Two immature adult females were found free in the fæces of the colon. In the fæces no ova of Œsophagostome were found—a few ankylostomes.

DESCRIPTION OF THOMAS'S ŒSOPHAGOSTOME, BY A. RAILLIET & A. HENRY.

To simplify the description of the Brazilian Œsophagostome, the study of which has been entrusted to us by Dr. H. Wolferstan Thomas, we shall first and foremost recall the general characters of the groups with which the worms of this genus are connected.

The genus *Œsophagostomum* belongs to the family of the Strongylidæ, the sub-family of the *Ankylostominæ*, to the order of the *Œsophagostomeæ*.

The *Strongylidæ* are Meromyarian-nematodes (Schneider), secernentes (Linstow's) the œsophagus of which is more or less club-shaped, inflated. The males have two equal spicules and a caudal pouch provided with ribs. The females possess two ovaries.

The forms with buccal capsule constitute the sub-family of the *Ankylostominæ*.

The order of the *Œsophagostomes* has as its principal characters :—Caudal pouch with bifid frontal and middle ribs, the posterior and posterior external rising from a common trunk, the posterior bifurcated. Vulva at a short distance from the anus; uterus divergent. Ventral slit more or less evident.

Finally the genus (Molin) *Œsophagostomum* answers the following diagnosis :—Frontal extremity showing a slight cuticular projection (peristemic swelling), behind which there appears usually a second much fuller swelling (cephalic vesicle) which stops suddenly in the ventral region at the level of a transverse depression (ventral slit) existing even in the absence of the vesicle. Mouth opens into a buccal capsule of little height, furnished with a

short dorsal tunnel. Buccal margin, provided with lamellæ (external crown); frontal border of the buccal capsule bearing besides short tongues (internal crown), six cephalic papillæ; two cervical papillæ. Male with two (prebursal) papillæ. Female with two caudal papillæ.

All these characters are found combined in the parasite collected by Dr. THOMAS. It will therefore be sufficient for us not to lay stress on its specific peculiarities.

Body cylindroid, thick, attenuated only towards the extremities. Tegument striated across; striæ separated by 27μ at the level of the termination of the œsophagus. Cephalic papillæ crossing the peristomic swelling; the two lateral ones having a wide base and blunt point, the four sub-median longer, more acute and with cylindrical base. Cephalic vesicle progressively attenuated behind and only stopping abruptly at the ventral slit, which is situated 360-365μ from the mouth. A little forward of this slit, the vesicle contracts a little. Cervical papillæ slightly symetrical, situated 500-550μ from the mouth. External crown consisting of 38 lamellæ, the free extremity of which being semi-circular. Internal crown with short tongues in double number. Buccal capsule very depressed; average height 22μ with a minimum on a level with the dorsal tunnel; ellipsoid transverse section with large dorso-ventral diameter of 115μ with small diameter of 97μ. Œsophagus 1·1 mm. long to 1.2 mm.—200 by 225 to 275μ maximum width, bell-mouthed (wide opened) at the frontal extremity, where its chitinous wall forms six large ribs or blunt teeth.

Male 17 to 22 mm. long, 750μ broad. Caudal pouch with thick ribs; frontal and middle split, posterior and posterior external rising from a common trunk, the posterior ones bearing a short lateral branch, inserted about

their upper third and bent inwards. Spicules 1·38 mm. to 1·475 mm. long, at the end slightly sharp.

Females 16 to 20 mm. long, 900μ wide. Caudal extremity abruptly attenuated and terminated by a small conical appendix, occasionally turned up towards the dorsal face. Anus at about 250μ from the posterior extremity; vulva at 500-525μ; these two orifices not giving rise to any tegumentary protuberance. Ovojectors very near; uterus very short, in the shape of an oblong, a little bent.

None of the females examined contained any eggs. In short they were immature forms.

If from the foregoing description we try to determine the relations of this Œsophagostome, one is led first and foremost to eliminate the forms, the crowns of which comprise only a small number of lamellæ, such as the *Œsophagostomum brumpti*, Railliet and Henry, 1906, which is also a parasite of man.

A closer comparison associates it on the other hand, with the forms possessing crowns with numerous lamellæ. One of these attracted our attention at once, namely, the *Œsophagostomum dentigerum* of the chimpanzee, which we described in 1906, of which the dimensions, the œsophagoid armature, the length of the spicules agree in a striking manner with the peculiarities observed in the Brazilian parasite.

We suspected besides a similar relationship between the latter and the *Œsophagostomum Stephanostomum* (Stossich) 1904 of the gorilla. Stossich's too summary description unfortunately did not allow of our pronouncing an opinion on this poiut. But thanks to the kindness of Messrs. Shipley and Leiper, we have been able to examine the specimens which have served as types to the

species, and to acknowledge that our anticipations were well founded.

In fact the parasites of man, of the chimpanzee, and of the gorilla, represent nothing more than varieties of one and the same species.

The differences we have been able to observe between these three forms are in fact of small importance. Those which appeared to us constant exist especially in the caudal pouch of the male.

In the *Œsophagostomum Stephanostomum* type the external branch of the posterior rib is inserted perceptibly in the upper fourth of the free posterior side of this rib and turns directly outwards.

In the *dentigera* variety, this branch is inserted in the upper third and bends downwards, so as to follow a direction parallel to that of the main branch.

In the Brazillian variety, it is inserted in the upper third and bends inwards, in order to come into contact with the main branch. Finally the caudal extremity of the female appears to have suffered here a much more abrupt bending than in the two preceding forms. We propose to call this new human parasite *Œsophagostomum Stephanostomum* var. Thomasi.

Let us observe, in conclusion, that its relationship with the Œsophagostomes of the chimpanzee and of the gorilla, would tend to attribute it to an African origin.

Mr. T. Pugh Beddoes said he would like to know what were the symptoms in this case, and whether there were any manifestations different from the ordinary symptoms of dysentery and diarrhœa. Also did the local men in any way differentiate this affection from the other cases which they had seen?

Dr. THOMAS said the case in question was only in the Hospital three days, and the patient was delirious the whole time. From the class of patient brought to the public wards they were seldom able to obtain any clinical data. The patients were generally brought in practically moribund and occupied the beds in the hospital only for a very few days, and thus did not give much opportunity for the collection of data to work on. In this case there was certainly severe dysentery, as he had been told when passing through the ward by the doctor attending the case, and as the patient was beyond recovery he was left alone. In many of the cases which he had seen in sheep and goats there was certainly no diarrhœa.

As regards BRUMPT'S case in man there were no data at all, but he (Dr. THOMAS) believed this case was supposed to have had slight dysentery. The physicians in the Amazon region probably seldom made postmortem examinations, and they had not in consequence been able to tell him if this was the first case which has occurred. He did not think the condition was very common, or he would certainly have observed it amongst the numerous postmortems which had come under his notice during the period he was engaged in making his observations.

Dr. R. T. LEIPER said he would like to congratulate Dr. THOMAS very warmly on the case demonstrated. It seemed to him an exceedingly interesting contribution to tropical helminthology. The only case of Œsophagostomiasis previously recorded in man was of little pathological interest. No details of the lesions had been given and only six specimens, all immature, had been found. Dr. THOMAS' patient on the other hand had apparently died of the intense infection.

Apart from the intensity of the infection there were two points in this case that struck him as of especial interest: First, the lesions extended for a considerable distance up the small intestine; this was exceptional, for the disease usually confined itself entirely to the great intestine. Secondly, the case seems to have terminated at an early stage in the infection, for no adult worms were found in the lumen of the intestine. The infection probably dated from a single draught of infected water. The worm larvæ would enter the blood from the stomach, according to WEINBERG, and be disseminated by the blood stream to the walls of the intestine; there they would form the little blood cysts so beautifully illustrated by Dr. THOMAS, and on approaching sexual maturity would break through the mucosa into the lumen of the intestine. The sexually mature pairs would then produce ova that would pass out in the fæces.

He hoped Dr. THOMAS would be able to tell them something of the condition of the liver and the spleen. In monkeys suffering from Œsophagostomiasis, a considerable amount of pigment was noticed in these organs.

Turning to the description of the worm, he noticed that Professor RAILLIET now considered *Œsophagostomum stephanostomum* and *O. dentigerum* to be the same species, but that there were certain varieties. He (Dr. LEIPER) did not feel inclined to support the view that there were "varieties" distinguished from one another by real and constant characters. He regarded them all as *Œsophagostomum stephanostomum*—the common parasite of African monkeys; for it would be observed the only difference mentioned by Professor RAILLIET as distinctive of the new variety was the internal twisting of the lateral branch of the posterior rays. That this was not a constant

character and could not therefore be valid was actually demonstrated by the illustrations of specimens that had just been shown by Dr. THOMAS. In allied genera one found distinctive specific characters, especially in the configuration of the mouth capsule, but none were mentioned here. He doubted therefore the wisdom of regarding this South American form as new and distinct from the common African *Œsophagostomum stephanostomum*. Dr. THOMAS' excellent and exceedingly valuable description would nevertheless always remain as the first real case of Œsophagostomiasis in man.

Dr. THOMAS said he had to thank Dr. LEIPER for his remarks. He presented this subject to the Society that evening because he wished to publish his report in January and had to give the plates to his printer. He would endeavour to send Dr. LEIPER some male specimens for examination. He was very pleased to find that the Œsophagostome of Brazil differed from the Œsophagostome which BRUMPT had described, and certainly if one read Professor RAILLIET'S description of the Œsophagostome and compared it with the Brazilian variety, it was quite evident that they were slightly different, but he thought this difference was chiefly in the lamella.

NOTES ON STIMSON'S SPIROCHŒTE FOUND IN THE KIDNEY OF A YELLOW-FEVER CASE.

[By Asst. Surg. A. M. STIMSON, Hygienic Laboratory, Public Health and Marine Hospital Service.]

The spirochætal origin of yellow fever has been suggested by SCHAUDINN and by NOVY, but so far as I know no organism belonging to the genus *Spirochæta* has been reported as having been found in yellow-fever tissues. I have examined some tissues for this class of organisms, using the method of LEVADITI, as employed for the demonstration of *Treponema pallidum* in syphilis. The available yellow-fever material was unfortunately limited to the tissues from one case, all other specimens having been fixed otherwise than in formalin, which is required by LEVADITI'S method. The brain, liver, heart, and kidneys were examined. Nothing of special interest was observed in the first three, but in the kidney a very definite organism was found, having the following characters: Colour, opaque black, in sharp contrast to the surrounding tissues; general appearance strongly suggesting a *spirochæte;* often irregularly curved, but some individuals having a regular series of alternate curves, no other indication of segments being observed; one or both extremities often bent back in the form of a hook; entire length variable up to 14μ or more; width estimated at $\frac{1}{6}\mu$; length of short curves, $1\frac{1}{2}$ to 2μ. It was confined to the cells and lumina of the tubules of the kidney, none being observed in the blood vessels, glomeruli, or interstitial tissue. While in some fields no organisms were present, in others large numbers were crowded together or

scattered individuals were observed. The kidney from another case of yellow-fever, where the tissue had been fixed in bichloride of mercury and acetic acid, was examined, and while no stained organisms were found, structures resembling those described were present in an unstained condition. The organisms were not found in kidney tissue from a patient dying of malaria, although the tissue was properly fixed and stained.

The object of this report is simply to invite attention to the findings in a single case, since no opinion as to the significance of this organism can be formed from such meagre data. For convenience of reference I would suggest that the organism be called *(?Spirochæta) interrogans*, the specific name being suggested by the form, somewhat resembling a question mark, which the organism frequently assumed in my preparations.

"MOSSY FOOT."

Dr. THOMAS showed three photographs of so-called Mossy Foot of the Amazon Region. The disease affects the natives of some of the tributary rivers flowing into the Amazon river, notably the Purus, Javary, Branco, Tapajos, and probably some others. It appears to be a papillomatous infective growth affecting the feet. In this case the whole of the right foot was covered with a dense warty-looking hard growth, in many places from a quarter to three quarters of an inch thick. It was very vascular and is sometimes exceedingly painful. The sole of the foot was free, but patient acknowledged that he had burnt out one or two small areas. In various places on both legs, other areas were seen. Treatment is the actual cautery knife. Cure is usually rare.

Dr. HARRISON of Belize, British Honduras, sent to Dr. STEPHENS of the Liverpool School of Tropical Medicine a photograph, showing apparently the same disease affecting the leg of a negro boy. Other cases have been seen where both legs were covered with the growth from the feet up to the mid-thighs. The limbs are usually greatly swollen and indurated. No history of filiariasis has been discovered in these cases. Blood has been repeatedly examined and has proved negative. A portion of the growth was dissected out and introduced under the skin of the nose of a rabbit. In three weeks' time a small warty growth was detected, which increased in size until it resembled a small horn, about half an inch high.

Microscopical sections of the tissue show polychromatic staining elongated, often granular bodies, occurring in the connective tissue of the growth. To a certain extent they resemble the clasmatocytes described by RANVIER, MARCHAND and ADAMI.

Dr. J. M. H. MACLEOD said that the cells referred to by Dr. THOMAS were typical mast cells, and that the tissue had the characteristic appearance of the papillomatous growths which were familiar phenomena in certain skin diseases, such as elephantiasis, syphilis and granuloma pudendi. The prevalent opinion, though not definitely proved, was that this type of lesion was due to a staphylococcus infection, but the exact staphylococcus was yet undecided.

Sir PATRICK MANSON said he had seen similar papillomatous growths in the skin with elephantiasis in China, and he attributed them to an extensive hypertrophy of papillæ as a sequel of lymph stasis, together with, possibly, a staphylococcus infection superposed.

Mr. PUGH BEDDOES said that in connection with these granulations one must bear in mind that there were certain other conditions, particularly Peruvian warts, in which granulations were extremely copious and likewise bled. There was a suggestion that a condition of Peruvian warts was due to secondary surface infection occurring in a paratyphoid infection, and possibly these growths were likewise simple surface infections. It would be interesting if Dr. THOMAS could give them a report of the vegetable parasites that occurred in that district, but he thought the opinion of a good many was that local tropical granulations were entirely due to surface infection, and when they occurred on the legs vascular stasis caused them to be more than ever vascular.

YELLOW FEVER.

Dr. THOMAS gave a synopsis of his experiments in trying to infect rabbits and guinea pigs with yellow fever by the bites of *Stegomyia calopus*, which had previously fed on virulent cases of the disease, and by inoculation of blood from patients into animals.

The animals used for the experiment were bred in the laboratory in mosquito-proof cages, and were thoroughly protected from accidental infection. The chimpanzees and *Macacus rhesi* were imported from Europe in mosquito-proof cages. Great importance was ascribed to the elaborate precautions which are necessary to insure successful results. All the mosquitoes were bred in the laboratory. They were fed on virulent cases of the disease on the second day of the fever, and were kept at 28·32 degrees centigrade for 20-30 or more days before being used to infect an animal.

Guinea-pigs which had been bitten by infected Stegomyia calopus evidenced a reaction in $4\frac{1}{2}$-13 days. The animal appears dull, it remains crouched up in the corner of the cage. The appetite is lost. A rise of temperature of 1-2 degrees centigrade, which persists 2-3 days is noted. The animal recovers. Stegomyia, which have been fed on the guinea-pig during the period of fever, can later on cause a reaction when allowed to bite a non-immune animal. An animal which has exhibited the reaction is immune to the bites of infected Stegomyia.

A reaction was exhibited in the following experiment. Stegomyia, some time after feeding on a case of yellow fever of the second day, were allowed to bite a chimpanzee. During its reaction fresh Stegomyia fed on it and later bit non-immune guinea-pig I., which reacted. The process was repeated, and non-immune guinea-pig II. reacted. Chimpanzee II. was bitten by Stegomyia which had been fed on guinea-pig II. It is interesting to note that chimpanzee II. reacted less markedly than chimpanzee I.

Four guinea-pigs were bitten by infected Stegomyia and were then divided into two lots. One lot kept at ordinary temperature in the laboratory, the other lot kept in outer chamber of refrigerating plant at 12-14 degrees centrigade. Guinea-pigs at room temperature exhibited reaction many days before the cool chamber lot. Stegomyia infected from room temperature lot caused reaction later on when they bit non-immune guinea-pigs. Cool chamber lot of guinea-pigs produced no reaction.

Experiments were made to see if it was possible to produce a more virulent infection. A large batch of Stegomyia were allowed to feed on a severe case of yellow fever of the second day. They were then kept at a high temperature for three weeks and applied to a second case

of yellow fever of about the same duration. These proceedings were repeated on seven successive cases, a period of three weeks intervening between each application of the mosquitoes. The surviving Stegomyia were then allowed to bite the chimpanzee which had been infected in November, and later on had proved resistant to inoculations of virulent blood, and bites of ordinarily infected Stegomyia. At the same time, some of the batch were allowed to feed on an immune individual,* who had proved immune to inoculations of virulent blood and bites of infected Stegomyia. Both man and chimpanzee developed fever, the former in 4½ days, the chimpanzee in about five days. This experiment was repeated with immune guinea-pigs with corresponding results.

Dr. THOMAS pointed out that with animals so resistant to infection, as guinea-pigs and rabbits, the symptoms would resemble the mild cases of an influenza type so frequently seen in yellow-fever epidemics, and of symptoms of the character occuring in young children in endemic areas. Black vomit and anuria, etc., were only seen in very severe or fatal cases of the disease in man.

Sir PATRICK MANSON said he wished to congratulate Dr. THOMAS on his paper, and also on his courage in exposing himself to an inoculation of infected blood. Everything that was done in an intelligent way to elicit truth was a thing worth doing, and a man who in this way voluntarily exposed himself to such a risk was worthy of all praise. He would like to ask Dr. THOMAS to explain the rationale of the Anti-Yellow Fever Sanitation measures the value of which had been so abundantly proved in many places in America, if they were to suppose that the

* The individual referred to was Dr. THOMAS himself.—ED.

lower animals were susceptible of infection. He did not doubt Dr. THOMAS' results, but it was reasonable to suppose that if Stegomyia fed on man with yellow fever could communicate the disease to a guinea pig, a mosquito fed on guinea-pig with yellow fever, could communicate the disease to man. If that were the case, what measures had been taken, intentionally or unintentionally, to prevent Stegomyia from feeding on the lower animals, and so conveying the disease to man?

Dr. THOMAS said he thought the Havana measures had worked principally at stamping out Stegomyia. He was working with the lower animals and was working under artificial conditions. He kept his infected Stegomyia at a temperature which they could not get in nature. Ordinarily one would not find the temperature kept so equal as he did in his incubators, and that he thought would greatly account for it. Moreover, he believed that if the larger animals like dog, cat, and other domestic animals could be infected, they would develop yellow-fever in just the same manner as the native South American developed it. In infants and very young children the disease showed up for a couple of days and then recovered. He had one great difficulty to contend with, and that was he was unable to get volunteers to submit to inoculation.

A SKIN AFFECTION OF THE ISLAND OF NEVIS, BRITISH WEST INDIES,

Associated with Fibrous Nodules and Intense Itching, erroneously called by the Natives "Guinea Worm."

By J. NUMA RAT, M.R.C.S., St. Kitts

For a long time past, cases have been frequently coming under my observation in the island of Nevis, in which persons of the labouring class, consisting of negroes and mulattoes, chiefly agricultural labourers, have suffered from subcutaneous tumours, generally originating in the lower limbs, and attended with distressing itching.

To these growths the people have given the name "guinea-worm," from their resemblance to the well-known ailment from which their African ancestors suffered when imported as slaves from Africa. There is, however, no likeness whatever to the Dracunculus medinesis in the subcutaneous tumour, when extracted, which seems to be simply a granuloma, more like a syphiloma than any other pathological growth.

Were it not for the absence of corroborative symptoms, one would readily declare these granulomata to be simply syhpilitic gummata, but, besides the lack of proof, there are wanting that degeneration of the growth which is found in syphilomata and the consequent puckering and fibrous character of the resulting cicatrices. In the case, for example, from which the specimens were taken, the forearm about the bend of the elbow was closely covered with remarkably deep ulcers after the granulomata had been extracted, which in the case of gum-

mata, could not have failed to leave characteristic scars; instead of this, these ulcers healed readily and left only linear scars, which were slightly raised and were hardly fibrous.

Another symptom which distinguishes them from syphilitic gummata is the intolerable itching with which they are attended. In the case of a syphiloma, ulceration of the overlying skin may be expected to occur, and by this means the contents of the tumour will be expelled. The patient who suffers from the so-called "guinea-worm" knows that the skin must be destroyed by some powerful caustic, such as corrosive sublimate or bluestone, before the granulomata can be extracted. The fact that the patient is willing readily to endure such treatment is the best proof of the distressing character of the itching, and it is really only for that symptom that the medical man is consulted, but the ulcers resulting heal rapidly after the growth has been removed.

The general condition of the patient is also quite different to that which is found in syphilitic cases; the patients not only look healthy, but robust and energetic. The children are also healthy, and abortion does not take place in the case of women with families.

History of the Case from which the Specimens were taken.

E. B., twenty-eight years old, negress, unmarried, no children, well fed, robust, and apparently in excellent health.

Previous History.—About thirteen years ago, when about fifteen, she noticed a leucodermatous patch on the skin on the front of her right ankle. This gradually spread over the dorsum of her foot and a hand's-breadth up the

front of her leg. The patch itched very much from the first, and has continued to do so. The itching has not been incessant, but ceases for a few days, returning with varying severity.

Some months after the first appearance of this patch, she began to suffer from a dermatitis of the sole of the right foot, the skin of which fissured, attended by thickening of the epidermis, distressing itching, and pain so severe as to prevent her walking.

From the time this affection of the sole appeared until now she has had repeated attacks of it. The pain and the fissures disappear after resting the foot and rubbing the sole with some greasy substance, but the itching is not relieved by these means. The dermatitis returns after she has walked about for a few days.

When the foot is very painful, some of the femoral lymphatic glands on the same side become enlarged.

After a time, subcutaneous tumours of various sizes began to appear in the area of the discoloured skin. They did not force their way through the overlying tissues, nor were they attended by any inflammation or ulceration. They caused the itching to become so intolerable, that the patient was compelled to destroy the skin above them with sulphate of copper, so as to be able to extract them and so obtain relief. When the skin was sufficiently destroyed, the tumours were extracted with the point of a needle. They were all yellowish white, cartilaginous in consistence, flat on the surface next to the skin, and convex where they rested on the deeper tissues. They varied in diameter from one-sixteenth to one-fourth of an inch.

A set of similar tumours appeared on the leucodermatous patch on the right leg some time after those

on the foot. They caused the same intolerable itching, and did not cause any inflammation or ulceration of the superjacent skin. They were extracted in the same way as those on the foot.

Another crop of the same growth afterwards appeared all over the face, and chiefly on the forehead. They presented the same symptoms, and were dealt with in a similar way.

In January of the present year, a number of the tumours developed under the skin of the left arm, on its flexor side, over an area of about two inches above and two below the bend of the elbow. While those extracted from the foot, leg and face were of the sizes and shapes above mentioned, those extracted from the arm, though of the same colour and consistence, measured as much as half an inch or more in diameter and about one-eighth of an inch in thickness, and were flat on both surfaces.

A solitary tumour of the same size, shape and colour as those extracted from the leg, foot and face was extracted by the patient with the point of a needle, in my presence, from the flexor surface of the forearm, about an inch above the bend of the wrist. The skin of this part, being thin, had softened without the application of any caustic, and the growth was removed without difficulty.

The tumours first sent to Dr. Daniels were taken from the flexor sides of the upper arm and forearm, about the bend of the elbow. The one last sent to him was the growth extracted from the flexor side of the forearm, about an inch above the wrist.

Present Condition.—There are numerous superficial scars, lighter in colour than the surrounding skin, and

Figure 1.

Figure 2.

PHOTOGRAPHS ILLUSTRATING DR. NUMA RAT'S PAPER

Figure 3.

Figure 4.

PHOTOGRAPHS ILLUSTRATING DR. NUMA RAT'S PAPER.

varying in size from one-sixteenth to one-eighth of an inch, chiefly on her forehead, a few being found also on her cheeks.

Over the dorsum of her right foot and the lower part of the extensor surface of her right leg, a continuous patch of leucodermatous skin is seen, and the sole of the foot on the same side is fissured. Several glistening scars, varying in size from one-eighth to one-fourth of an inch, are scattered over this patch. These scars are superficial and lighter in colour than the surrounding skin. Several raised linear scars, darker than the surrounding skin, and varying from half an inch to one inch in length, and from one-eighth of an inch to a quarter of an inch in width, are to be seen on the flexor surfaces of the left arm, above and below the fold of the elbow, as shewn in *Figure 1*.

The skin appears to be healthy over other parts of her body.

She complains of pain and itching in the sole of her right foot. The itching is felt constantly, but the pain only when she walks much. The skin begins to crack after the sole has been painful for a short time.

There is almost constant itching, not only in the affected parts of the skin but elsewhere also where it seems to be quite healthy—such as the abdomen, the right hand and lower half of the forearm, the dorsum of the left foot, etc. She does not suffer from fever, and, with the exception of the pain and itching, she feels in excellent health. There are no other symptoms suggestive of syphilis or any other disease.

Other Cases.

R. P., aged thirty-two, negress, has had eight children, who are all living—the eldest being thirteen years and

the youngest one year and ten months old. She has been quite well all her life, with the exception of occasional fever and headache.

She was attacked about two years ago with the "guinea-worm" over her right outer ankle. She had it for a month before coming under treatment, and was cured of it in two months' time. In September, 1908, she was attacked with "guinea-worm" in her right shoulder. She came under treatment in November, 1908, and was cured in a month. In February, 1909, the complaint showed itself in her left shoulder, and has continued there up to the present time.

The skin over the granulomata has ulcerated, and has revealed five cavities of about the size of a shilling each. The granulomata extracted from these cavities were similar in appearance to those already sent for examination.

When attacked by the "guinea-worm," she suffers every night from fever, which leaves her when the granulomata are extracted.

There is a great deal of itching in the affected part and considerable pain, which extends to the neck and arms.

The method by which the tumour was removed from the left shoulder was as follows:—A strong solution of chromic acid was frequently applied to the skin over it for several days. This caused that portion of the skin to shrivel and part from the adjacent integument, and revealed the edges of the underlying tumour. The outer half of the under surface of the growth had freed itself from the tissues beneath, but the inner half was still firmly adherent, and had to be severed from them by the help of scissors. The specimen represents only that portion of the tumour over which the skin had been

destroyed. This was severed from the remainder, which extended inward, and was firmly attached to the integument and the adjacent tissues. When freshly removed, the growth was a quarter of an inch thick, and measured one and a half inches by seven-eighths of an inch.

Figure 2 shows the cavity left in the posterior triangle of the neck after the skin had been destroyed and the tumour extracted. Similar cavities were produced in the other patients by the application of caustics, and yet these filled up and healed in the manner seen in the illustrations.

R. S., mulattress, twenty-two years old, unmarried, has had no children.

She was attacked in 1907 with "guinea-worm" on the dorsum of her right foot. This began as pimples, which developed into lumps about quarter of an inch in diameter. These spread in a line across the middle of the instep. They were attended with intolerable itching, on account of which she obtained admission into hospital. Every effort was made to give her relief, including the use of the Pacquelin cautery, for the purpose of destroying the growths, but the itching continued and she left the hospital unrelieved.

When seen as an out-patient some months after, she informed me that on the advice of some neighbours, she had destroyed the skin over the tumour by means of perchloride of mercury on bread poultices, and had extracted them with the point of a needle. After this, the itching ceased. A set of these growths had now appeared half-way up the leg on the same side. These varied in size from one-eighth of an inch to one inch. They were dealt with in the same way as those on the foot. For the result see *Figure 3*.

Towards the end of 1908 the dorsum of the other foot and the lower half of the corresponding leg were attacked in the same way. The scars left by the ulceration resulting from these growths, which are shown in *Figure 4*, were slightly depressed in this case and somewhat darker than the adjacent skin, but were not in any way like the puckered fibrous cicatrices of syphilomata.

Dr. J. H. M. MacLeod presented the following report on the histology of the tissue sent by Dr. Numa Rat :—

Unfortunately no conclusive opinion could be expressed on the histopathology, as the tissue had been imperfectly fixed and was found to be friable, and the sections showed a certain amount of debris. It was difficult to cut, and did not stain well.

Sections were cut and stained of two nodular pieces of tissue and a piece of skin. The nodular pieces of tissue showed no evidence of epidermis and seemed to be the result of change in the corium. They consisted mainly of hypertrophied connective tissue forming a compact mass, made up of thickened collagen bundles, such as occur in keloid and sclerodermia. On the upper part of the dense fibrous mass the tissue was less compact, and presented a few capillaries and a cellular infiltration. This infiltration consisted partly of (1) a simple inflammatory deposit of small lymphocytes, small connective tissue cells, and a number of polynuclear leucocytes more or less broken up—an infiltration such as occurs in an ulcerated surface—and (2) an infiltration of a more chronic inflammatory type, composed largely of plasma cells, and approaching in character that of a septic granuloma. There was no evidence of parasites in the tissue such as the eggs of acari, etc. It was impossible to decide from

the tissues whether the keloidal change was secondary to the inflammatory changes, and had occurred some time later, or whether it was of the nature of sclerodermia, and had become secondarily infected with pus-organisms from scratching. There was no suggestion in the tissue of syphilis, tuberculosis, yaws, etc., and any granulomatous change noted could be easily explained by the presence and prolonged action of a slightly virulent staphylococcus.

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